

# **2007 Annual Progress Report Jatropha oil for local development in Mozambique**



*A *Jatropha curcas* plant nine month after planting, Farmers' Club in Cabo Delgado*

**June 2008  
FACT Foundation**



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# 1. The project

## 1.1 Summary

### Objective

The objective of this pilot project is to build an infrastructure and capacity to enable the autonomous upscaling of the activities after termination of the project. The project will initiate the local production of *Jatropha curcas* seeds and develop a local market of end-users of the oil. The creation of capacity among the local small farmers and technicians is an important component of the project.

### Project elements and expected results

As a first element, the project will create between 250 and 500 ha of land cultivated with *Jatropha curcas* after 3 years. The sites will be located in 5 different areas spread over Mozambique (from north to south), in which the local counterpart ADPP has had a long-lasting presence.

The production of *Jatropha curcas* will be done by small farmers who are united in 25 farmer organisations (the so-called “farmers clubs” or FCs in short), which are supported by ADPP and will be coordinated by FACT. The national research institutes (FNR Mozambique with IIAM) will carry out both on-station and on-farm research to investigate different varieties, pests, diseases, and the use of biological pesticides with the aim to achieve a high and sustained production of the *Jatropha curcas* crop with minimum use of external inputs.

The second essential element of the project is the development of a local market for the oil, which can be used to operate diesel generators for schools, to run corn mills and as a fuel for vehicles equipped with a diesel engine. Local technicians will receive training on how to convert diesel systems for plant oil operation, which involves the assistance of experts from abroad. The oil will be pressed at 5 different sites (within 5 schools and/or 5 small enterprises) to create a guaranteed initial market for the farmers to sell the seeds and the oil. Another option is the use as lamp oil for lighting in the villages and as a prime material for soap production.

It is expected that at the end of the project a market will have been created for 25 diesel engines distributed over 25 villages. The knowledge acquired from this project will be disseminated and the experiences and local revenues will generate new, comparable projects.

Another important element is the creation of a training centre for bio-fuels, where the obtained knowledge can be transferred to interested parties in the Southern African region.

The main objective of this component is to establish efficient training of technicians to master the skills related to *Jatropha* production, processing and use. There is hardly any experience in Mozambique related to *Jatropha*. But there is a great interest from the Government, large commercial companies and private farmers to start production. It is therefore the right time and very convenient to establish this Training Centre as an extension of the *Jatropha* activities that will be started. This will be a great support to the many *Jatropha* farmers united in the Farmers' Clubs and to their activities. It will also contribute greatly to the future biofuel development in Mozambique.

### **General Findings of status per end Dec. 2007:**

- The context of *Jatropha* developments supported by Humana has extended to neighbouring countries as well. Christian Fenger of GAIA movement has made proposals and obtained funding for projects in Zambia and Zimbabwe, which include a *Jatropha* component;
- ADPP and other project partners are working very hard under difficult circumstances but continue to make good progress.
- Farmers Clubs, although they have just started cultivating *Jatropha*, are in general interested and cooperating;
- ADPP has obtained funding from USDA for supporting FCs in the whole of Mozambique for the next three years, which will be beneficial for the FACT project as well;
- There are old *Jatropha curcas* plants to be found in one specific location the project area from which seeds can be obtained (130 kg in Nov. 2007);
- Another 200 kg of seeds was brought by car from Chimoio to Bilibiza by Flemming Nielsen in November.

### **Crop Production**

- About 100,000 seeds were planted at the beginning of the project (Jan-Mar), with an approximate germination rate of 30 per cent;
- 24 of the planned 25 Farmers Clubs have been established;
- 7 steel hand rope pumps have been installed, 16 newly dug wells lined out and 3 old wells rehabilitated;
- 21 nurseries were established with 1,000-2,000 plants each;
- Training has been given to FC leaders;
- Household survey of approximately 200 families executed;
- 330 kg of seeds was available for planting at the start of rainy season (December 2007). From mid November to the end of December, 22 clubs received 12 kg each. As the rains began mid to late December, only a small portion of seeds were planted prior to the end of the year.

### **Processing**

The first survey on existing diesel sets was executed by Jan de Jongh, in Bilibiza and Quisanga, inspecting 4 diesels. Most of them are used for powering maize grinding mills. The survey showed that all 4 diesels were only a few years old, from Chinese make, and of the Direct Injection type, which is less easy to fit for running on pure plant oil than the old fashion Lister type of diesel engines with pre-chambers. The survey needs to be completed by the ADPP team, for all the 15 diesel engines in the area of operation. It was therefore decided that more attention and time is needed to find a universal but as simple as possible modification kit for the diesels and to test those kits long term, before modifying any of the diesels in the field. This will be done in 2008.

- From a number of suppliers of oil presses quotations were requested and an overview was made. Most important is to have a supplier that can provide spare parts

quickly and can easily provide training to the operators. One supplier in Maputo and one in Harare with a dealer in Mozambique, both supplying the same Chinese make of press were found.

- The dairy farmer Brendon Evans in Chimoio was visited by Jan de Jongh, to discuss the experiences he has with his Chinese press, bought from the company in Harare.

His experiences are quite good, only replacement of the bearings was needed, apart from the regular maintenance.

## Research

- A trial of pre-treatment of *Jatropha curcas* seeds showed that untreated seeds had as high germination rate as any of the tested treatments. Pre-treatment of seeds is therefore not recommended under Mozambican conditions.
- Comprehensive collection of pests in *Jatropha curcas* was undertaken in the project areas in collaboration with Eduardo Mondlane University during the month of November. The survey is currently being extended to cover the whole country with support from other donors.
- Preliminary identification have been undertaken and samples that could not be identified have been submitted to the Plant Protection Research Institute in Pretoria, South Africa which in turn has enlisted assistance from Prof. Maurizio Biondi, Italy, who is a specialist on southern African *Alticinae* spp.
- From systematic observations and monitoring it appears that:
  - The risk of direct seeding is low compared to the savings in working hours.
- *Jatropha curcas* performs almost as well in un-shaded nurseries as in shaded ones provided they are watered sufficiently.
- Both hypothesis will likely be evaluated more systematically but because the two practices can have significant positive impact on the project it is recommended to consider them immediately before scientific trials have been conducted.
- Researchers were asked to inspect a number of *Jatropha curcas* fields where many plants had died after pruning. It is likely a fungal attack caused by pruning during the rainy season. Until further information is available it is recommended only to prune during the dry season.
- 200 kg of *Jatropha curcas* seeds were pressed in Chimoio at Evan's farm. The press cake will be applied during the rainy season to test their efficiency as a pesticide.
- Samples from two stands of old *Jatropha curcas* trees used as seed sources have been submitted for genetic analysis to the "Jatropha curcas evaluation, breeding and propagation programme" of Wageningen University and Research Centre (<http://www.jatropha.wur.nl>). One of the stands is used by the project and the genetic analysis can prove useful for the project in the future.





## Dissemination

Progress reports and other findings have been placed on FACT, Arrakis and GAIA websites. The activities have been reported to the National Working Group on Biofuels in Mozambique (twice).

In June the research team organised a 2-day workshop in Chimoio to share and discuss their findings with representatives from the extension service, NGOs and private farmers.

The research team created a private website that they use for sharing documents internally and with invited NGOs and private farmers. The site is private because much of the material is restricted.

## Market opportunities & issues:

- People need soap and lamp oil which can be made from Jatropha oil;
- Farmers need protection of fields against animals, that often eat half of the crop.
- In Quirimbas area, the number of diesel engines is small, no more than 15 diesel engines, mainly for maize grinding mills and types are varied;
- Practically no diesel generator sets are existing in the region;
- Presently, price distortion of seeds because of high demand for planting (from commercial plantations).

## Binga Lamp Soap, Diesel



## Training Centre

Plans for a mechanical workshop have been made and are still awaiting approval from District authorities before building can commence. A new diesel generator has been purchased for the centre and a small generator for the workshop will be purchased early 2008 to ensure its independence of work. Existing buildings in the centre are run down and activities have begun to improve their condition and create more appropriate training centre facilities.

## **The project organization**

FACT-Arrakis is coordinating the project and is taking the lead in disseminating and exchanging the gathered knowledge, expertise and information.

The partners are:

- Ajuda de Desenvolvimento de Povo para Povo (ADPP). Responsible for the “Agricultural production” component of the project;
- FNRMozambique, which works together with the National Agricultural Research Institute (IIAM) is responsible for research on pests, pesticides and *Jatropha* variety improvement; and;
- GAIA-Movement, an organisation based in Switzerland, which is supporting Humana organisations like ADPP is providing specialist support.

## **The role of Solidaridad.**

Solidaridad is one of the 3 funds providers for the project, besides DOEN and HIVOS.

Ruaraidh Petre South Africa (SSDC) is monitoring the programme for Solidaridad, while Soneni Ncube (Zimbabwe regional office) and Inez Hackenberg (Nampula) monitor it for Hivos.

## **1.2 Strategic Choices**

The vision of the project is in line with FACT’s mission statement which is: to support income generation of the rural population in developing countries by the sustainable production and use of biomass for energy purposes, with a focus on bio fuels.

The main aim of the project is to develop a local market for pure plant oil from *Jatropha*, which is produced by farmers clubs in remote, rural areas. The scope of the project is to realize 250 ha equivalent in hedges of *Jatropha curcas* and 20 existing diesel engines modified and running on *jatropha* oil.

During the inception meetings in Mozambique, in April 2007 the following modifications were proposed:

### Modifications to Contents:

The focus on major activities has changed from Mid Mozambique, i.e. Manica province to Cabo Delgado (Bilibiza). This has been done because EPF Bilibiza was more enthusiastic about the project than EPF Chimoio. In Bilibiza there is no power grid and *Jatropha* grows well. In Chimoio, there is a grid, the area is more developed than Cabo Delgado and the *Jatropha* was not doing well, because insects (flee beetles) were eating all the leaves.

Extension of the project to other provinces province is postponed till a later stage, when more knowledge of varieties, pest mitigation and economics is known.

In November it was decided to expand already in 2008 to three other provinces; Niassa, Nampula and Zambezia, because of the following reasons:

- The research group has not found reasons for serious concerns about *Jatropha curcas* being an important alternate host for major pests in crops and worldwide there has not been reported a single instance of African Cassava Mosaic Virus in *Jatropha curcas*. Because this research is ongoing precautions are advisable, e.g. avoid using *Jatropha curcas* to fence cassava fields.;

- Since the project period is short, it is necessary to start planting Jatropha as soon as possible, otherwise, hardly any seeds will be available within the project period for processing in the new provinces.

Due to the last point, it was also decided to propose in the workplan to extend the project with one half year, up to 2010, thus including 3 wet seasons.

Modifications to the Budget:

No major changes were made in the budgets for the main activities, only the detailed budget activities changed slightly, in accordance with the strengths and capabilities of the partners.

More subcontracts for specific assignments, such as for training, still need to be given out by FACT.

Modifications to Planning:

Since the contracts only came after start of the rainy season, only partial use could be made of the rainy season for planting Jatropha. It would be best to include at least 3 seasons, therefore it is proposed to extend the project to mid 2010. An official request for this, with other modifications has been made in the workplan for 2008.



## **2 Objectives and results**

### **2.1 Objectives and Sustainability**

#### Overall objective:

FACT's long-term goal is to make a tangible contribution to the development of biofuels in developing countries, enabling local communities to benefit from this renewable energy source also when supplying the world market on the medium term.

#### The project objective:

The objective of this pilot project is to build an infrastructure and capacity to enable the autonomous upscaling of the activities after termination of the project. The project will initiate the local production of Jatropha seeds and develop a local market of end-users of the oil. The creation of capacity among the local small farmers and technicians is an important component of the project.

Overall Objective			
	Indicators	Target value for the first year (planned and realised)	Source of verification
<b>Sustainability</b>	Number of Farmers Clubs operating in a more professional manner and selling to different markets	25 /24	See table 2
<b>Objectives</b>			
<b>1 Build a sustainable infrastructure</b>	Required equipment in place, such as: oil presses, oil storage and handling equipment,-  Sustainable supply chain of equipment and spare parts, plus sufficient people trained to maintain the equipment.	Investigation of suppliers, order of first oil press/both have been done.	See table 2
<b>2 Build capacity for upscaling of activities</b>	Not determined yet		
<b>3 establish continuous local production of jatropha seeds</b>	Number of farmers who have started jatropha cultivation for oil production	250/ca 240	See table 2
	Number of farmers trained in mitigating pest organisms	0/0	
<b>4 develop a local market of the end users of the oil</b>	Average annual income generated by the smallholders from sales of jatropha seeds.	0/0	
	Average increase in income of users of diesel engines running on jatropha PPO	0/0	
<b>5 Build capacity with actors within the project</b>	Numbers of farmers, extension workers and technicians trained	250 and 30 of EW, Technicians, TT's/200 farmers and 30 EW's etc.	See table 2
<b>6 Establish a regional training center for future expanding capacity building</b>	Training facilities and dormitories established	Start made/ Start made	See table 2
	Potentially strong leader of training center sourced	Not applicable for first year	
	Sufficient teachers trained and sufficient training material prepared	Start made/start made	See table 2

## 2.2 Results

Results	Indicators	Target value for the first year (planned value/realised)	Source of verification
<b>25 Mozambican rural communities producing jatropha seeds sustainably on at least 250 ha for energy use.</b>	Area covered with jatropha in ha, or ha equivalent for hedges	75/ca 30	Estimated by ADPP and baseline survey
	No of beneficiaries reached	Ca 1250/1000	Estimated
<b>2 A local market created in 25 communities</b>	Tons of oil produced	-/-	
	Nr of diesels modified	-/-	

## 2.3 Activities

### 2.3.1 25 Mozambican rural communities producing jatropha seeds sustainably on at least 250 ha for energy use

#### 1.1. Select 25 interested farmers clubs (FCs)

The project achieved the target of 25 clubs during the year, however, decided to close the Mahate club due to lack of interest and irreconcilable internal conflicts. Investigations are continuing with regards to opening a new club to bring the total back to 25.

#### 1.2. Train 25 EPF teacher trainees, 25 field extension workers as community mobilisers on jatropha cultivation and general environmental awareness

The prospective EPF teacher trainees for 2008 received one and a half months of basic training to prepare them for their work with the farmers clubs. The content of the training included an overview of the projects involved, conservation agriculture, an introduction to jatropha cultivation, environmental awareness and how to mobilise the community.

In November, a short but comprehensive course was held by Christian Fenger, International GAIA Movement, to revisit jatropha basics for Field Extension Workers and introduce some new information. Part of the content included different methods and patterns of planting (although direct seeding is favoured); nursery management and how to transplant seedlings from the nurseries; general maintenance including pruning; and a discussion about prices in order to clarify what a farmer can expect to earn on the market selling seeds for oil versus seeds for planting. The different practical uses of the plant were also reviewed and the FEW saw demonstrations on how to make soap and lamps using extracted oil.

As part of the USDA/EU Farmers Club projects, training will be held early 2008 for FEW and club committee members to learn more about their roles in the clubs and different ways to motivate and engage club members to be part of the farmers club activities.



### **1.3. Conduct 250 household surveys and establish baseline**

The baseline survey was undertaken by EPF teacher trainees during the month of October. Given the closure of the 25th club, Mahate, 240 surveys were planned, that is, 10 surveys for each club to be completed during weekends when trainees were not occupied with teaching. All existing surveys were delivered in by November, however on initial inspection around 20 are incomplete or missing thus bringing the total to approximately 220.

While the jatropha section of the survey has been entered (although not formally analysed), the baseline survey as a whole is yet to be entered and analysed. This process was scheduled to begin in November/December, however it has had to be postponed for early 2008. The responsibility of entry and analysis of the baseline survey will be given to a new International Volunteer who will be joining the project for six months starting February 2008.

### **1.4. Make 25 wells and install rope pumps for irrigation of nurseries**

During the first week of July, four extension workers and one technician of the general Farmers Club Cabo Delgado project, a mason from the village and several other people from the EPF centre received hand dug well, borehole and rope pump training sponsored by the Farmers Clubs EU project. Henk Holtslag, an international water expert came to Bilibiza for 5 days to conduct the training. This is the second time Henk has given training in Bilibiza. Thus the project had the opportunity to review past work and address some of the issues that have arisen associated with wells and rope pumps previously constructed and installed. The project water technician similarly spent 2 weeks in Tanzania on a similar course delivered by Mr Holtslag (courtesy once more of the Farmers Club EU project).

## **Wells**

Sixteen wells were newly dug and lined and three old wells were rehabilitated and dug deeper. In general, for many of the clubs the water is not deep to find, only a few metres, however there are some exceptions of wells needing to be 7-8 metres deep with the extreme at 60 metres. In some clubs, despite several wells being dug, water was not found. Digging was not attempted in at least two clubs where it is known that finding water is a serious problem and hand dug wells are unfeasible. In general, the five clubs without wells have access to a river or some other water source for some part of the year.

The process for constructing wells for the jatropha nurseries began during August, however it took much longer than expected given the realisation that concrete rings (reinforced with bamboo) were necessary for approximately 14 of the FACT clubs. The sandy terrain is a problem in the project area and the rings prevent the well's wall from caving in, making it permanent. It is recommended that each ring sit up to 20 days for the concrete to dry before digging can commence thus if an extra ring was found necessary, or if one broke during the process of introduction the construction would be delayed further. There were also some implementation issues with the first rings constructed being made with significantly different diameters (the maximum variation in 7 rings was 25 cm) making introduction into the well unfeasible. Being the first time to use this new technology (introduced by Henk Holtslag in the training mentioned above), these problems were ironed out towards the end of the construction period and solutions found where it would take too long to construct new concrete rings. Hence 61 rings were constructed to line 14 FACT club wells and rocks were used to line 2 more.

## **Pumps**

The structure of the simple wooden rope pump was refined during the training in July with Henk Hotslag, however it was decided that steel pumps would be more appropriate in the clubs given they last for much longer. 11 steel rope pumps were produced for the project and 7 have been installed. They can be used to irrigate vegetable gardens in addition to the jatropha nursery.

Production fell short of the goal of 19 pumps (to coincide with 19 wells). An unreliable energy supply from the centre generator during the months of August to December contributed to some of the difficulties in reaching targets hence some production was contracted out to a metal shop in Pemba. A new and larger generator (sponsored by the Farmers Club EU project) has now been purchased and installed and steps are underway to purchase an independent 15 KwV generator for the workshop to ensure it can operate independently from the centre generator.

Improving the quality and consistency of work of the Bilibiza pump workshop, including the water technician was also shown to be a priority and as such, the project expanded the pump production personnel to include a full-time mason to produce the pumps, an international volunteer to monitor production and the head of carpentry to oversee the workshop overall. During his 2 week visit to the project at the end of October, Jan de Jongh, FACT Foundation, delivered some training to the new team in production and installation of steel pole pumps. Following this, steel pole pumps were being produced of a reasonable quality.

A new water technician with a confirmed level of skill will join the project early 2008 and further training will be arranged for project staff with an international water expert in installation and pump maintenance.



### **1.5. Provide seeds and give training to farmers to start 25 nurseries**

Appropriate spaces for the nurseries were chosen in late August/early September and the physical structures for shade were established in all clubs barring two by mid-September.

A total of 39,000 seeds were initially distributed – 17 clubs receiving the targeted 2,000 and 5 clubs received 1,000, generally due to problems accessing water related to construction of their well late in the season, or issues with local sources. Several clubs did not establish nurseries because of the likelihood of elephants destroying them and several, which were constructed, were constantly in danger from the elephants. In these clubs, members expressed preferences to use seed for direct planting rather than for nursery production.

The seeds used for the nurseries were sourced locally in Litamanda and were found in some, but not all clubs to have a relatively poor germination rate. In consequence, more seeds were distributed as necessary to compensate for ungerminated seed.

The nursery established in Bilibiza planted an additional 2,000 seeds, however these were a mixture with some sourced locally in Cabo Delgado and others sourced from Chimoio (Manica Province, Mozambique), Guatemala and Tanzania.

One particular problem experienced in relation to the nurseries was sourcing polybags for growing the seedlings. Polybags are difficult to come by in northern Mozambique and those that are available are not reusable and are highly priced. One type of polybag was purchased from Zambezia Province in August although only three quarters of the order arrived due to supply issues. To counter this problem, seedbeds were introduced in the nurseries, however they have transpired to be less convenient as the pots seeing they need more care and knowledge to maintain and are not as easy for the club members to transport.

In certain areas, pests were eating the seedlings, however they were not a serious problem and samples were taken under the supervision of Flemming Nielsen, FNR for further testing. Another observation was that while trials from Chimoio found that jatropha seedlings maybe grow better in direct sunlight, in Cabo Delgado the plants appeared to need some shade, perhaps due to the higher intensity of the sun.

The four extension workers of the project are agricultural school graduates and since starting with the project they have received additional training in nursery management. The extension workers have thus trained the farmers club members how to enrich the pots and plant and care for the seeds. The Field Extension Workers (FEW) received extra training about transplanting seedlings in early November as part of the general jatropha course delivered by Christian Fenger, GAIA Movement.





#### **1.6. Sensitise and train 250 farmers to start cultivation of Jatropha**

Training farmers club members about jatropha cultivation has been and will continue to be an ongoing process. EWs and technicians provide impromptu advice and guidance on the spot in clubs when required, for example, in connection with establishing the nurseries. More formal training of FEWs has been provided in the Bilibiza centre. Those FC members who have been trained in jatropha cultivation will further promote it in their clubs and villages.

#### **1.7. Plant seedlings and directly seeding plots of 10 - 20 ha at each Farmers Club**

Some 103,000 seeds were planted directly at the start of 2007 between January to March, even before ADPP had received their contract, which shows their commitment. Selected areas were monitored to assess the growth of these seeds and it was found that the jatropha does well in most areas, but there are some problems with pests. A course on homemade biopesticides has been prepared by one of the project technician and should be implemented in 2008 to provide club members some guidance in experimenting with new ways to deal with the pests. There is also some incidence of damage by elephants trampling plants and baboons pulling them up in mistaking them for cassava, but on a relatively small scale. In general, these plants remained small and stunted through the dry period (April-November), although growth picked up quickly as the rains began late 2007.

During a training course with Christian Fenger in November, the FEWs decided the best course of action for their clubs was to directly plant their jatropha as fencing rather than plantations given the benefits of improved protection to their fields. Each club was allocated a new quantity of 12 kg of seeds to recommence direct seeding starting December 2007. Recommendations were given to the clubs regarding different planting patterns and dimensions and their possible benefits, however it was left to the members to decide which to

use. Given the priority of planting personal food crops at this time, the majority of the clubs will commence planting these seeds in January 2008.

### **1.9. Conduct annual field days, planning & review meetings**

Planning and review meetings with Project Leaders, Technicians, EWs and the International Volunteer (arrived September) have been held bi-monthly since June.

Field days will be held 2008, when there is more for the farmers to exhibit and more experience had in order to better facilitate the exchange of ideas. Field days will also include more general aspects of the farmers clubs including model conservation fields started under the Farmers Club USDA program and other environmental activities.

### **1.10. Prepare and set up 25 on-farm jatropha research plots of 1 ha**

The goal of 25 on-farm research plots was changed to 5 once practical considerations were taken into account, including the capacity of the FEWs to record the necessary information. No systematic trial plots have been established until now given the seeds of different varieties arrived in the dry season (May 2007) thus too late to enable planting.

Five FEWs from selected clubs received introductory training in May from Flemming Nielsen (IIAM) and Jacob Zulu (GAIA, Farmers Clubs) and another briefing was held with the Project Leader at the end of 2007, to facilitate preparations for setting up trials early 2008.

In terms of varieties, small quantities of seeds have been sourced from Tanzania, Guatamala, Chimoio (Mozambique) and locally in QNP at Litamanda. These different varieties will also be trialed as fences on model conservation plots set up in the Bilibiza centre. Besides testing the different varieties, over the years the trials will also test various pruning methods.

### **1.11. Monitor jatropha research plots**

The plan was to monitor research plots on an ongoing basis, however as yet there are no research plots to monitor (see above).

## **2 Market creation**

A first survey of 4 diesels was done in Bilibiza and Quisanga, to determine how these diesels could be modified. A questionnaire made by the FACT Gota Verde project in Honduras was adapted and used.

A first piece of soap made, a simple lamp was made and tests with pressing Jatropha seeds, using a small hand press, brought from Holland (make Piteba) were done by Jan de Jongh and the workshop team. These were demonstrated to the extension workers and the whole crew involved in the project during the training session done by Christian Fenger.

## **3 Knowledge varieties & pests**

Because of the late establishment of trials data on the performance of different varieties are not yet available.

A comprehensive survey of pests in *Jatropha curcas* was undertaken in close collaboration with Eduardo Mondlane University in Maputo. A student, Mrs. Pomme Gagnaux is writing her MSc thesis on pest in *Jatropha curcas* and did field collection together with Flemming Nielsen in the Provinces of Manica, Sofala, Zambesia and Cabo Delgado. A GPS was used to get the exact location of each sample site and the owner was interviewed using a questionnaire. The sampled insects were classified in Maputo. Samples that could not be identified were submitted to the Plant Protection Research Institute in Pretoria, South Africa

which in turn has enlisted assistance from Prof. Maurizio Biondi, Italy, who is a specialist on southern African Alticinae.

Samples of the yellow flea beetle that were submitted to Wageningen University and Research Centre were still not classified by the end of the year.

#### **4 Information made public websites FACT-Arrakis and GAIA**

All progress reports, made by ADPP, FACT, GAIA Movement and FNR-Mozambique have been placed on both FACT website as on the Arrakis website. A number of these have also been placed on the GAIA-Movement website.

The book “40 Acções do Movimento GAIA” (in English “40 Green World Actions”) written by Christian Fenger contains many low-cost /no-cost environmental activities relevant for communities such as the Farmers Clubs in Northern Mozambique.

The GAIA-Movement has produced new manuals (vermiculture, soap production) to be included in the second edition of the Portuguese book, and revised the manuals describing jatropha, moringa, conservation farming, water tanks, water filters, groundwater recharge, rope pumps, manual borehole drilling, etc.

The content has been tested and improved during training sessions with Field Extension Workers in Bilibiza during the stay in Oct-Nov. 2007.

Most of the layout work has been done, and it is expected that the book is ready for printing in India in December 2007. The revised edition will also be placed on the GAIA website, and others who are interested.

#### **5 Large proposals**

The GAIA-Movement has developed a proposal to EU for a 3-years food security project in Cabinda, Angola, which has been approved. Farmers are assisted to use their forest resources sustainably and increase forest over. One of the elements is to promote jatropha and to set up model engines that use the dual fuel system.

Another proposal to EU for a 3-year food security project in Malawi has been developed by GAIA and also been approved. Several hundred self-help groups will be assisted to set up irrigated gardens and to plant Jatropha as live fencing as protection of the gardens.

The GAIA-Movement has also submitted a proposal to Global Village Energy Partnership (GVEP) International for a continuation of the existing community development project involving the promotion of Jatropha and its use in stationary engines in Zambia (USD 118,000). GVEP has indicated that there is a good chance of funding, and an answer is expected before the end of the year.

#### **6. Other expenses not directly related to project activities**

All major office equipment and transport has been purchased and is listed below:

- 1 cab truck Toyace with 1.5 tonnes load capacity
- Motorcycles (3 Xintian (50CC), 1 Amhonda (125CC))
- 2 laptop computers
- 2 external hard-drives for back-up
- 2 digital cameras



- 1 printer/scanner/copia
- 2 office desks (made by the Bilibiza carpentry)
- 1 solar panel, inverter and battery

### **7 Expansion production**

Nothing done yet, not planned for 2007.

## **8. Setting up of Bio-fuel Training Center on bio-fuels in Central Mozambique**

### **8.1 Improving existing school building into centre and mechanical workshop**

Several improvements were begun in the centre during 2007, starting with the seminar dormitories, which were extremely run down and without satisfactory beds or mattresses. Doors, locks and windows are being repaired/changed, the walls painted, new beds built by the carpentry at Bilibiza and mattresses replaced. Given malaria is a problem in the area, mosquito nets have also been purchased for each bed. The rooms will cater for an average of 36 participants, however bunk beds have been installed such that, if necessary, more people can stay in the quarters.

Each seminar quarter has a bathroom, however given the lack of water experienced in Bilibiza during a large part of the year, the toilets are inappropriately designed. The idea was to build new toilet/shower facilities and designs are being reviewed once more before being submitted to authorities. In general, the project has given priority to more urgent tasks, however a single eco latrine has been constructed in the meantime to cater for the numbers. Over the course of this year, only several training sessions have been held.

The roofing of the carpentry in the Bilibiza centre leaked considerably in its run down state, thus the project purchased and had installed new poles and zinc sheets. Similarly, a simple cover has been constructed for the centre's cars and trucks to provide some protection from the sun and rain.

Considerable time has been spent drawing up and reviewing designs for the workshop for water pump and oil production to ensure the details are well thought out. Guiseppe, the International Volunteer is an environmental engineer and has thus improved the drawings and will supervise the construction. The project has given priority to more urgent tasks (oil production is no priority just yet), however it has also been a slower process than expected. Plans are currently with the authorities and many basic materials for the construction have been purchased in readiness.

A generator has been acquired for the ADPP total complex (supported by a farmers club project funded by the EU), however a separate generator for the workshop to allow some operating independence is still in the process of being purchased. A company has been contacted in Mozambique, which can supply a Chinese generator run by an Indirect Injection engine (best suited for adapting to run on plant oil). The project is awaiting confirmation on certain details before a purchase will be made.

### **8.2 Purchasing and installation of equipment, such as: oil press, bio-diesel production unit, cab-truck, etc.**

The only purchase in this section scheduled for 2007 was the single cab truck. A second hand 1.5 tonne Toyota cab truck was purchased.

A manual hand-press was also ordered at the beginning of October to allow for some experimentation with pressing oil, however the delivery has still not arrived from Maputo.

## **9 Exchange project**

Nothing planned for 2007, is too early in the project.

## **10 Administration**

Administration FACT Project management, executed by Jan de Jongh, team-member of FACT-Arrakis, comprised the following;

The work of Arrakis, mostly done by Jan de Jongh, is project coordination, but also technical backstopping and overall project management, which is done in the NL as well during field missions. The missions have been planned just before the delivery of the progress reports and workplans, twice a year.

The following activities were executed in 2007:

- attuned the different delivery schedules of reporting to all 3 donors into one schedule for all, in cooperation with STRO;
- Visited Solidaridad in NL and during mission trip, Inez Hackenberg of Hivos in Nampula.
- Prepared the subcontract to the partners and discussed with them the terms and contents;
- Prepared with FACT the payments to the partners;
- Prepared a format for the progress reports and for financial reporting, based on general conditions of the donors;
- Held a preparation meeting in Chimoio with Flemming Nielsen, and ADPP members already in Nov 2006, before the start of the project to discuss most urgent approach, like collecting seeds and planting before start of the rainy season in December 2006;
- Obtained seeds from Diligent Tanzania and Octagon Guatemala and mailed these to Bilibiza by DHL. Of the seed from Tanzania a selection of the best seed was made, by using an electric fan and gravity to separate the seeds.
- Held a first mission to Bilibiza in April, and started with an inception meeting with project leaders, Felicity Dennis, Christian Fenger, Flemming Nielsen en Harrie Oppenoorth and Soneni Ncube from Hivos. Further made field visits to inspect jatropha planted and water wells. Assisted Felicity with preparation of the first workplan.
- In Maputo, Jolanda Cintura of the National Working group on biofuels was met and our project introduced;
- Prepared the first progress report;
- In between the periods of the two missions, regular e-mail contact with the partners was held.
- A second mission was executed in October-November, during which both Technical Assistance was given in rope pump production, improving workshop, advise in organisational set up. Field surveys were organised, partly together with Rory Petre of Solidaridad, South Africa. A first trial with pressing of Jatropha seeds was done with a hand press brought from the Netherlands and soap was made for demonstration purposes using soy oil. Inputs were given to the progress report in the making by Felicity. With Christian and Felicity several meetings were held to discuss the workplan for 2008. A first diesel survey was done in the area. During the return trip, Brendon Evans in Chimoio was visited. He is using two oil presses in which he

presses cotton seeds. In Maputo a supplier of Chinese presses was visited and information obtained.

- All progress reports were collected and placed on websites of FACT and Arrakis, and some on the website of GAIA-Movement.



**Table 2: ADPP FARMERS CLUB ACTIVITY RESULT ANALYSIS ‘Biofuel for Development and Communal Energy Self Supply’, 2007**

<i>Main activities for whole year 2007</i>		<i>Planned results up to 31 Dec 2007</i>	<i>Actual results up to Dec 2007</i>	<i>Variation</i>	<i>Explanation of variation, problems encountered. Solutions proposed</i>	<i>New estimate of results per July 1, 2008</i>
<b>1. 25 Mozambican rural communities producing jatropha seeds sustainably on at least 250 ha for energy use</b>						
<b>1.1</b>	<b>Select 25 interested farmers clubs (FCs)</b>	25 FCs established	24 FC clubs established. One of the clubs was closed due to little interest and research is still being undertaken to locate a new club.	24 functioning clubs	The project will start up a new club to reach the target 25 clubs.  The clubs must show interest in running the activities. Outside forces cannot make successful clubs.	25 well functioning clubs
<b>1.2</b>	<b>Train 25 EPF teacher trainees, 25 field extension workers as community mobilisers on jatropha cultivation and general environmental awareness</b>					
	- 25 Teacher trainees (TTs)	2008 TTs trained in sustainable agricultural basics and as community mobilisers	TTs received 1.5 months training as community mobiliser in Oct/Nov 07			
	- 25 Field extension workers (FEW)	Training of FEW conducted as joint courses at Bilibiza and as on the spot training by technicians and Extension Workers	A comprehensive training course on jatropha cultivation conducted at Bilibiza for 30 FEWs, FCC members, EWs and PTs (Project Technicians).  20 clubs have received training on the spot by EWs and PTs.			New experiences gained from FACT, GAIA, IIAM and elsewhere transferred to FEWs.  Environmental awareness raised through training by TTs.
<b>1.3</b>	<b>Conduct 250 household surveys and establish baseline</b>	250 HH Surveys conducted and processed	220 HH surveys have been conducted and the specific jatropha section processed during Dec 07.	Less 30 HH. Surveys are not yet fully processed.	30 surveys were not filled out properly. The project will use the remaining 220 to establish the baseline.	The full survey analysis completed. No new surveys planned for 2008. The next ones will be made start of 2009.
<b>1.4</b>	<b>Make 25 wells and install rope pumps for irrigation of</b>	Wells have been built and pumps installed in the majority of the 24 clubs	3 old wells have been rehabilitated by digging them deeper. 16 of the FCs have dug wells and installed well rings.	16 new wells and 3 old wells were reached.	The water technician was trained in pump production and other water technologies during 1 week in July at Bilibiza (with other staff) during 2	All 25 FCs have wells with rope pumps for production of jatropha seedlings and

<b>Main activities for whole year 2007</b>		<b>Planned results up to 31 Dec 2007</b>	<b>Actual results up to Dec 2007</b>	<b>Variation</b>	<b>Explanation of variation, problems encountered. Solutions proposed</b>	<b>New estimate of results per July 1, 2008</b>
			<p>5 clubs used river water for their nurseries this year.</p> <p>11 steel rope pumps were produced and 7 have been installed. They can be used to irrigate vegetable gardens in addition to the jatropha nursery.</p>	Less pumps installed than planned. The project has found that the technicians needed more training before producing and installing all the pumps.		
<b>1.5</b>	<b>Provide seeds and give training to farmers to start 25 nurseries</b>					
	- Set-up nursery at EPF	Established jatropha nursery at EPF.	The jatropha Project Technician has established a well-functioning nursery for production of jatropha and other useful plants.			The nursery multiplies a number of jatropha varieties for distribution to FCs.
	- EWs & FEWs trained on-farm and through joint training sessions	EWs and 25 FC members trained in establishing jatropha nurseries.	<p>A comprehensive training course on jatropha cultivation conducted at Bilibiza for 30 FEWs, FCC members, EWs and PTs.</p> <p>20 clubs have received training on the spot by EWs and PTs.</p>			New experiences gained from FACT, GAIA, IIAM and elsewhere transferred to FEWs.
	- Acquire seeds, preferably of different varieties	Sufficient seeds acquired to distribute 2,000 seeds to each FC - corresponding to 25,000 plants at a 50% survival rate.	Sufficient seeds were acquired locally (same variety) to supply up to 2,000 seeds to each FC. Flemming from IIAM supplied an additional 200kg (3-400,000 seeds) from Chimoio (a different variety) for general planting.		The project has decided to calculate 1 ha as 1,000 plants (e.g. a spacing of 4 x 2.5), and primarily promote jatropha for fencing. With 2 plants/m this corresponds to 500m.	Sufficient seeds to plant the remaining 250 ha acquired (125 km of jatropha fencing)

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	- Seeds distributed & nurseries established	25 nurseries have been established and have planted 2,000 jatropha seeds.	21 FC nurseries were established with between 1000-2000 jatropha seeds planted. Difficulties in sourcing polybags meant many clubs were required to plant directly into seed beds.	3 nurseries were not established due to problems with elephants or access to water.	The plan was slightly delayed due to difficulty in finding reliable seed and in numerous cases because specially made well rings needed to be made in order to enable well digging in the sandy soil. 2000 seeds were distributed and planted in each of 17 clubs. 1000 seeds were distributed to clubs, which were facing some problems establishing the nursery due to issues with water, elephants, lack of polybags or theft, for example.	25 nurseries producing part of the seedlings for 125 km of jatropha fencing. The remaining fencing will be planted by direct seeding.
<b>1.6</b>	<b>Sensitise and train 250 farmers to start cultivation of Jatropha</b>	Ongoing process of training farmers club members about jatropha.	Activities conducted in the FCs by EWs and PTs in connection with establishing the nurseries.  The 30 FEWs and FCC members, who have been trained in jatropha cultivation will further promote jatropha cultivation.			Specific training sessions in jatropha cultivation held in all FCs and jatropha promoted at field days and community events.
<b>1.7</b>	<b>Plant seedlings and directly seeding plots of 10 - 20 ha at each Farmers Club</b>	No planting in the dry period. Direct planting will commence again when the rainy season begins mid-late December.	Selected areas have been monitored to assess the growth of the 103,000 seeds planted directly at the start of 2007. The jatropha does well in most areas, but there are some problems with pests. There is also some incidence of damage by elephants and baboons, but on a small scale.  Each club received 12 kg of seeds to recommence direct seeding in December 2007. Given the priority of planting personal food crops at this time, the majority of the clubs will commence planting these seeds in January 2008.		A more systematic assessment of different varieties and treatments (e.g. pruning) will be carried out in connection with establishing the trial plots. The farmers are happy with the growth of their jatropha.	12.5 km of new jatropha fencing established (2 plants per meter). Existing fencing filled up by planting cuttings.

<b>Main activities for whole year 2007</b>		<b>Planned results up to 31 Dec 2007</b>	<b>Actual results up to Dec 2007</b>	<b>Variation</b>	<b>Explanation of variation, problems encountered. Solutions proposed</b>	<b>New estimate of results per July 1, 2008</b>
<b>1.8</b>	<b>Harvest and sell seeds</b>	Not planned for 2007.	Some of the FCs, because of the project, have found that they had jatropha fences in their communities. 122 kg of seeds have, for example, been purchased in Litamanda.			An estimated 500 kg of seeds purchased from FC member communities.
<b>1.9</b>	<b>Conduct annual field days, planning &amp; review meetings</b>	Bi-monthly planning meetings held with Project Leaders, Technicians & EWs.	Planning and review meetings have been held since June with Project Leaders, Technicians, EWs and the International Volunteer			Bi-monthly planning/review meetings held.  Field Days held in all FCs.
<b>1.10</b>	<b>Prepare and set up 5 on-farm jatropha research plots of 1 ha</b>	Prepare and train 5 farmers to set up trial plots of 1 ha.	The seeds of different varieties came too late (in May 2007) to enable planting (rainy season ended). Preparations have been made to start these trials early 2008.	No systematic trial plots have been established until now.	5 specific trial plots will be established including as live fencing. Besides testing the different varieties, the trials will over the years test various pruning methods.	5 x 500 m established as trial fencing to assess various varieties (if possible), cultivation and pruning methods.
	- Train EWs, technician and 5 FEWs to set up trial plots.	Train EWs, technician and 5 FEWs to set up trial plots.	5 FEWs including EWs & technicians have been trained in basic jatropha cultivation and have received initial briefing on the research plots.	The 5 FEWs will receive the final training from the PLs	The technician and PL will, together with Flemming Nielsen (IIAM) and Christian Fenger (GAIA) set up guidelines for the trial fences.	5 FEWs managing their trial fences successfully.
	- Acquire different varieties	5 jatropha varieties being assessed in fencing trials.	Small quantities of seeds have been provided from Tanzania and Guatemala, but these have not been used in systematic trials.	Sufficient quantities of only two varieties.	Fencing trials will be made with local seeds, from Chimoio and (if possible) Tanzania and Zambia.	Fencing trials testing at least 3 jatropha varieties.
<b>1.11</b>	<b>Monitor jatropha research plots</b>	Research plots being monitored on ongoing basis.	No research plots to monitor yet.	(see above)	The jatropha technician and the PL will be in charge of collecting data before July 2008.	Data on growth and (later) yields and pruning registered.
<b>6. Other expenses not directly related to project activities</b>						
	- annual audits	None	None			2007 accounts audited
	- motorbikes and bicycles	3 Motorbikes purchased	3 Motorbikes purchased			3 Motorbikes functioning

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	- office equipment, 2 laptops 2 digital cameras	2 laptops and 2 digital cameras purchased	2 laptops and 2 digital cameras have been received. The office is fully set-up and a solar panel, inverter and battery allow some independence from the main generator.		Laptops, cameras and PV system functioning	
<b>8. Setting up of Bio-fuel Training Center on bio-fuels in Central Mozambique</b>						
	<b>Improving existing school building into centre and mechanical workshop</b>					
	- Improvement of dormitories and other accommodation	Further improvements made	Doors, locks and windows repaired/changed. Walls painted. New beds built and mattresses replaced. Mosquito nets for each bed.  Refurbishment of 2 staff quarters/visitor accommodation – paint, furniture, mosquito nets.			Seminar dormitories and other accommodation up to standard
	- Construction of new toilet and bathroom facilities	Plans submitted to authorities	A detailed design of the toilet/bathroom building is being reviewed before submission to the authorities. A new eco latrine has been constructed in the meantime.	No plans submitted	The project has given priority to more urgent tasks. Only few courses have been held.	A building with toilet and bathroom facilities in use.
	- Construction of new roofing for the centre carpentry	Improvements made	The poles and roofing were replaced in the centre carpentry.		This structure will be adjacent to the workshop when constructed and will provide an outdoor working space.	
	- Construction of workshop for water pump production	Workshop for pump production constructed	Detailed designs have been made of the building and have been submitted to the authorities. Many materials for the construction have been purchased in readiness.	Not constructed.	The project has given priority to more urgent tasks. Guisepppe, the International Volunteer (an environmental engineer), has improved the drawings and will supervise the construction.	Workshop for pump production constructed.
	- Construction of jatropha oil production unit	None	Will be part of the building with the pump workshop (see above)	Not constructed.	Oil production is no priority now, and the project has given priority to more urgent tasks.	A building constructed where future oil production can take place.

<b>Main activities for whole year 2007</b>		<b>Planned results up to 31 Dec 2007</b>	<b>Actual results up to Dec 2007</b>	<b>Variation</b>	<b>Explanation of variation, problems encountered. Solutions proposed</b>	<b>New estimate of results per July 1, 2008</b>
	- Centre generator / workshop generator	Generator acquired for the centre.	<p>A centre generator has been acquired (supported by a project funded by the EU).</p> <p>A company has been contacted in Mozambique, which can supply a Chinese generator specifically for the workshop, run by an Indirect Injection engine (best suited for adapting to run on plant oil). It is important the workshop can operate independently of the centre generator.</p>	The workshop generator not purchased.	The Chinese generator (15 KVA) will be purchased early 2008.	A generator running the workshop and as back-up for the school centre.
	<b>Purchasing and installation of equipment, such as: oil press, bio-diesel production unit, cab-truck, etc.</b>	Cab-truck purchased	<p>1.5 T cab-truck purchased.</p> <p>One manual hand-press purchased for experimentation.</p>			The cab-truck functioning well.



### 3. Reflection on risks and impact

#### 3.1 Risks & Opportunities

##### Risks for the target group

Farmers may be reluctant to grow Jatropha if they fear that pests and diseases are transferred to other crops (specifically cassava, which belongs to the same family). Research into this matter has a high priority for this reason.

The risks for the vulnerable farmers are low. In case of a loss of harvest (due to an insect plague, a drought or whatsoever), the farmer will only lose the invested labour. The absence of fertilizers and costly irrigation equipment in the Jatropha production scheme prevents the farmer from ending up with a debt he cannot pay for. In this respect, there have been several negative experiences in Mozambique, in particular with the production of sesame, tobacco and cotton.

<b>Strengths (internal)</b>	<b>Weakness (internal)</b>
The main strength is the long term relation of the main partner ADPP with the local farmers, due to which probably the best solutions are chosen. I.e. jatropha is planted in hedges, around their common training fields, and training is causing higher yields of the food crops. This results in raising energy crops combined with increased food production. Hopefully this will give the farmers the reason to stay on this spot, instead of shifting their cultivation, with slash and burn	<ul style="list-style-type: none"> <li>• Short project period 3 years</li> <li>• Finding good people needed for the project is another challenge as they should be willing to work and stay in rural areas</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
because FCs are being created in the 3 new provinces by ADPP with the aid of the before mentioned USDA program the project can extend to these areas as well.	<p>Traditional agriculture is shift cultivation with slash-and-burn;</p> <p>The present hype of jatropha, causing a high demand for jatropha seeds to be used for plantations which is driving up the costs of the seeds to a level which is far too high to make production of oil economic viable.</p> <p>When this price will go down, the farmers might loose interest in jatropha, but this is far too early to tell.</p>

## Challenges and adjustments made in the Workplan for 2008



Traditional agriculture is shifting cultivation with slash-and-burn. No good seeds are available, nor fertilizer used, nor mechanisation, only machetes and hoes. After a few years of cultivation the weed pressure – and in some cases the reduction in soil fertility – forces the farmers to move on to a new plot of land. Because of this, it will be a major change already to motivate the farmers to stay on one spot, the one common demonstration field where they are trained. The farmers' clubs will be taught conservation farming with the aid of the ADPP extension workers, on their common training fields. The *Jatropha* will be planted in hedges to keep smaller animals away from their fields, instead of in plantations. Such fields are quite abundant in the Quirimbas park area, where animals and people are adapting to each other.

The FCs are the most important actors in this mechanism and have been given all attention in the start-up phase of the project. Their role is crucial.

The expansion to other provinces in Mozambique (originally planned for 2009), has been re-scheduled to start in 2008 already. It will take at least two years after planting before some harvest can be obtained; one should also be prepared that in the other provinces, different conditions prevail. For 2008 extension has been planned to the areas: Niassa, Itoculu and Macuse.

This will increase the chance that at the production of *Jatropha* will be successful in more than one area. The selected provinces have been chosen because FCs are being created here by ADPP with the aid of the before mentioned USDA program.

To obtain sufficient harvest the project should preferably cover a minimum of 3 rainy seasons. This implies, that the project should not finish before June 2010 (instead of Dec 2009). The project duration has been adjusted accordingly to 3.5 years.

Finding good people is another challenge as they should be willing to work and stay in rural areas.

Therefore, during 2008 one skilled person will be sourced to develop the knowledge and skills required for leading the Training Centre afterwards.

From the first survey of diesel engines in Quirimbas park, it followed that a variety of engines are being used. After finalizing the full survey, it will be investigated whether a standardized modification kit for diesels can be found (or developed) in 2008. This would include a period of test trials, before existing diesels will be modified (which is now planned for in 2009). This test and research component for identifying or developing a kit was not foreseen for in the original workplan and budget.

### **3.2 Reflection on strategy and impact**

It is still too early to give an indication of the sustainability and impact of the project, since only the first step; setting up production of Jatropha in the Farmers Clubs, has been achieved in this first year.

Only when oil can be produced and diesels have been modified to run on it, which is planned for 2009, first indications about sustainability and impact can be made.